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ABSTRACT

To determine the number and types of spelling errors made by college students, a study examined students' spelling errors on four complex word patterns which occur in related words. Fifty students attending a four-year engineering institute were selected and classified as group A (good readers/good spellers) or group B (poor readers/poor spellers) based on recommendations from their English professors and by a Spache-based spelling test. Reading ability was determined by Nelson Denny Test, Form C, 1973. Students were asked to spell words occurring in pairs with a change in the quality of the pronunciation of a vowel or consonant and/or stress pattern of the derivative, (e.g., vowel reduction in "compete"/"competition," or alternation from silent to articulated consonant in "malign"/"malignant"). Scoring focused on the critical grapheme or graphemic sequences preserving the relationship between the pairs, and classified errors as either phonetic or nonphonetic. Results show that group A had mastered the spelling of difficult words, and had internalized phonological rules governing predictable changes in word pairs; group B had not, presumably because of their limited familiarity with print. The few errors made by group A were generally phonetic, while group B's were overwhelmingly nonphonetic. Group A appeared to spell on a lexical rather than a phonological level; group B relied on phonological information which is usually ineffective when spelling polysyllabic words with silent letters and changes in stress patterns. (JG)

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An Analysis of the Spelling Errors of College Students on Four Complex Word Patterns

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An analysis of the spelling errors of college students on four complex word patterns

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Accurate spelling is a difficult task which requires a high degree of linguistic competence and an understanding of the structure and function of the written code. An analysis of students' spelling errors provides valuable information about the spelling process and students' general written language development (Hodges, 1982, p. 41). An increasing number of studies indicate that spelling errors are seldom random or haphazard, but rather very systematic and logical (Ganchow, 1981; Henderson & Beers, 1977; Read, 1971; Zutell, 1979). Spelling errors seem to fall into "predictable categories as a consequence of children's age and learning experiences" (Henderson, 1981, p. 7).

There appears to be a qualitative difference in the spelling errors of young children who are just beginning to read and write and older students who are proficient readers and writers (Marsh, Friedman, Welch, & Desberg, 1980). Most of the recent research, however, has focused on the invented spellings and spelling errors of young children. There have been very few studies focusing on the spelling errors of older students. The few studies which have been conducted have been primarily descriptive (Shaughnessy, 1977; Sloan, 1980; Wing & Baddley, 1980) and have focused on the source or frequency of errors rather than the nature of the errors.

PURPOSE

An investigation of college students' spelling errors seemed warranted to fill in some of the gaps in our understanding of the developmental nature of the spelling process. The purpose of this study was to examine the number and types of spelling errors made by college students who were good readers/good spellers and college students who were poor readers/poor spellers when spelling four complex word patterns which occur in related words. Since these patterns occur more frequently in written than spoken discourse (Moskowitz, 1973), they are seldom mastered until the later stages of spelling development (Templeton, 1979). The patterns reflect higher order phonological rules which determine a predictable change in the quality of the pronunciation of a specific vowel or consonant and/or stress pattern in the derivative, as in "di **vine**" and "di **vin** i ty."

ANALYSES OF ERRORS

Before discussing the word patterns and the errors analyzed for this study it is necessary to briefly review some of the error classification systems. The traditional approach to spelling error analysis has focused on a quantitative rather than a qualitative study of errors. Errors were classified according to their position in the word. (e.g., the beginning, middle, or end) (Mendenhall, 1930) or according to the omission, substitution, or transposition of a grapheme (Gates, 1937; Schonell, 1936; Spache, 1940). The classification of errors was frequently very subjective and included many overlapping categories. Most of the classification systems were not standardized in any way and, as a result, allowed for very limited interpretation of children's spelling performance or strategies (Anderson, 1982).

More recent error analysis systems have attempted to focus on the developmental nature of the spelling process and the acquisition of strategies.

Spelling errors have been analyzed according to the omission, substitution, or transposition of a grapheme in a particular spelling pattern, such as words with a long or short vowel or words with a double consonant (Henderson & Beers, 1977; Shaughnessy, 1977; Zutell, 1979). Some of the classification systems have also included categories for carelessness (Wing & Baddley, 1980) and phonetic sound unit misspellings, nonphonetic sound unit misspellings, and total sound unit misspellings (Fairbanks & Hobbs, 1982).

To provide information about the spelling process and the development of written language competence, however, an examination of students' spelling errors must go beyond a study of the omission and insertion of letters. An examination of spelling errors must be based on the recent research which describes English orthography as a complex system which does more than merely represent sounds or speech (Chomsky & Halle, 1968). Studies conducted in the past 15 years indicate the orthographic system is a highly regular system which represents linguistic information at the levels of sound, meaning, and syntax. The regularity of the system is based on its direct correspondence to meaning units rather than sound units. Although English orthography represents the sounds in words to some degree, it more consistently reflects the structural patterns and the underlying meanings of words (Becker & Dixon, 1980). Many words that are similar in meaning are similar in spelling. Predictable phonetic variations are not usually represented in order to preserve the semantic relationship among words. To illustrate, although the words "define" and "definition" differ phonetically, they are similar in meaning and spelling.

Thus, it is possible to consider some spelling difficulties in terms of a "lack of awareness of the linguistic representation of linguistic knowledge at different levels" (Frith, 1978, p. 283). For example, some spelling errors may reflect deficits at the level of sound or phonemic analysis and how phonemes relate to graphemes. A deficit in the analysis of sound would explain errors that do not sound correct, such as "oppersition" for "opposition." Some errors may also reflect a deficit at the level of meaning or morphemic analysis and how morphemes relate to phonemes. A deficit at the morphemic or meaning level would explain errors that sound correct but refer to a different meaning, such as "their" for "there".

METHODS AND PROCEDURES

Selection of Subjects

The subjects involved in this study were students attending a four-year engineering technology institute located on the outskirts of a large Southeastern city. Subjects were selected on the basis of their reading and spelling ability. All foreign students and students identified as learning disabled were excluded from the study. A total of 50 students ranging in age from 18 to 30 were selected after testing a total of 215 students for reading and spelling ability. Both the good readers/good spellers group and the poor readers/poor spellers group contained 25 students. Students' reading and spelling abilities were determined on the basis of several criteria. Reading ability was determined by the *Nelson Denny Test*, Form C, 1973, a commonly used test for measuring comprehension and vocabulary at the college level. Those students who scored above the 70th percentile comprised the good reader group, and the students who scored below the 30th percentile comprised the poor reader group.

Spelling ability was determined by recommendations from students' English professors as well as performance on a specially devised test modeled after Spache's spelling test (1940) which is based on an agreed list of words of a certain difficulty level. *Spache's Spelling Errors Test* was selected as a model because of its demonstrated content, concurrent, and predictive validity. The spelling test developed to classify subjects as good or poor

spellers was administered to regularly scheduled English classes with the permission of the instructor or to small groups of students referred by instructors. To ensure for consistency in the administration of the test, a tape was used with all students.

The spelling test developed for this study for classification of students as good or poor spellers included six categories of complex word patterns: (1) words with double letters; (2) words with silent letters; (3) words which change the "y" to "i" when forming the plural; (4) word pairs illustrating a vowel reduction pattern; (5) word pairs illustrating a vowel alternation pattern; and (6) word pairs illustrating a consonant alternation pattern (see Figure 1). The six categories were selected as test items because they represented categories of words consistently misspelled by a population similar to the population under investigation in data previously collected by the researcher. The first three categories (double letters, silent letters, and words which change "y" to "i") included a total of nine words, or three words for each category. The last three categories (vowel alternation, vowel reduction, and consonant alternation) included a total of 18 words, or 3 word pairs for each category. The total number of test items was 27. Items were scored as either correct or incorrect.

Students who met the reading criterion were placed in spelling ability groups on the basis of the median split technique. Students whose scores fell above the median on the spelling classification test were placed in the good speller group, while students whose scores fell below the median were placed in the poor speller group. The three students who scored at the median were assigned to the good speller group on the basis of their composition instructors' recommendation.

Selection of Experimental Items

Four complex word patterns which occur in word pairs with a change in the quality of the pronunciation of a vowel or consonant and/or stress pattern of the derivative were selected for this study. The patterns were vowel reduction as in the pair "compete"/"competition," vowel alternation as in the pair "divine"/divinity," consonant alternation as in the pair "critical"/"criticize," and consonant alternation from a silent to articulated consonant as in the pair "malign"/"malignant."

Eighteen word pairs were selected for this study (see Figure 2). All of the words in the vowel reduction and vowel alternation category contained either a tense **a**, **i**, **o**, or **e**. The **a** ([ey]) and **i** ([ay]) are front vowels, or vowels articulated with the highest part of the tongue arched toward the front of the mouth. The **o** ([ow]) is the back vowel, or a vowel articulated with the highest part of the tongue arched toward the back of the mouth. Since vowel alternation occurs more frequently among front vowels than back vowels (Chomsky & Halle, 1968), two front vowels were selected and one back vowel was selected.

All of the words in the consonant alternation category included either **t**,**c**,**g**,**b**, or **n**. The consonant alternation category included two types of word pairs. The first five word pairs contained derived forms in which the pronunciation of the consonant is altered from a [t] to a [ʃ] or [k] to a [s] or a [t] to a [tʃ]. The second five word pairs contained a base word in which the consonant was silent and a derivative form in which the consonant was articulated.

Administration of Experimental Items

After the good readers/good spellers groups and poor readers/poor spellers groups were selected, the pairs of spelling words for each category were dictated to the subjects in two separate sessions during spring quarter, 1982. The words were presented in random order on a tape to insure for

consistency in administration. Students were told that they were being tested on 18 words to study their spelling ability. They were also told that each word would be pronounced only three times. The first time the word was simply pronounced; the second time the word was pronounced in the context of a sentence; the third time the word was pronounced again. Students were instructed to write the correct spelling for each word after it has been pronounced for the third time. If they were unfamiliar with a word, they were instructed to "do the best that they could."

At the completion of the second testing session students were asked to respond to two questions. First, they were asked why the investigator tested them on those particular words. Secondly, they were asked if they noted any pattern to the test items selected. They were instructed to write their answers on the back of their papers.

Scoring Procedure

The scoring procedure for each of the word patterns being tested focused on the critical grapheme or graphemic sequences that preserved the relationship between the pairs. Errors were classified as either phonetic or nonphonetic by the investigator. If there was a question about the classification of an error, an independent rater was consulted.

1. Phonetic errors were those errors which occurred at the level of sound or phonemic analysis and involved the substitution of a logical but inappropriate graphemic element as in the spelling of "competition" as "compltition" or "criticize" as "critisize." To further illustrate, if a student spelled "divinity" as "divenity," his error was classified a phonetic error and tabulated for analysis.

2. Nonphonetic errors were those errors which occurred at the level of meaning or morphemic analysis and involved the omission of the key feature in the lexical base as in the spelling of "criticize" as "critize," the transpositon of graphemic elements, as in the spelling of "muscular" as "musuclar," and the addition of inappropriate graphemic elements as in the spelling of "defamation" as "defiamation." Nonphonetic errors also included the substitution of another word for an item and a blank item resulting from a "no attempt." If a student spelled "residential" as "residental" or "defamation" as "deformation," his errors were classified as nonphonetic and tabulated for analysis. Other errors a student may have made such as the spelling of "inspiration" as "insiration" or "commercial" as "comercial" were not recorded for statistical analysis since they involved a feature which was not being examined.

Design and Results

A 2x2x4 factorial design with repeated measures was used to examine the interaction effects of reading/spelling ability, error type, and spelling patterns. There were two grouping factors: reading/spelling ability (good readers who are good spellers—good readers/good spellers; and poor readers who are poor spellers—poor readers/poor spellers) and error type (phonetic errors and nonphonetic errors). The within-subject factor was spelling pattern (vowel reduction, vowel alternation, consonant alternation, and consonant alternation from silent to articulated). Where interactions occurred, simple ANOVAs and a priori contrasts were run to determine the effect of spelling ability and spelling pattern on error type.

The good readers/good spellers group had a total of ten errors which included seven phonetic errors and three nonphonetic errors. The students in the poor readers/poor spellers group, in contrast, had a total of 130 errors which included 36 phonetic errors and 94 nonphonetic errors on the four word patterns. The four word patterns were vowel reduction, vowel alternation, consonant alternation, consonant alternation from silent to articulated.

The first test for interaction among ability group, spelling pattern, and error type was significant, $F(3,288) = 16.27$, $p. < .001$. An analysis of the spelling errors of good readers/good spellers only resulted in no significant interaction between error type and spelling pattern, $F(3,144) = 1.40$, $p > .05$. A significant main effect for spelling pattern resulted, $F(3,144) = 3.15$, $p < .05$, while no significant main effect for error type occurred, $F(3,144) = 1.59$, $p > .05$. A priori contrasts revealed that only the consonant alternation pattern yielded a significant difference between phonetic and nonphonetic error types, $p < .05$.

Analysis of the spelling errors of poor readers/poor spellers, however, resulted in a significant interaction between error type and spelling pattern, $F(3,144) = 15.16$, $p < .001$. A priori contrasts for each spelling pattern revealed that consonant alternation, $p < .01$, and consonant alternation from silent to articulated resulted in significant differences between the phonetic and nonphonetic error type, $p < .001$.

QUESTION RESPONSES AND COMMENTS FROM STUDENTS

When questioned about the selection of test items and the appearance of any pattern, the good readers/good spellers group stated that the words were related or similar forms. Some of them also noted that the forms represented different word classes when "endings" or suffixes were added to the base word or root. Most of the poor readers/poor spellers group, however, did not perceive any pattern in the test items. Some of the students in the poor readers/poor spellers group stated that the test items were selected because they were commonly misspelled words. Although a few of the students in the poor readers/poor spellers group noted that some of the words had "endings," most of the students failed to recognize the relationship between forms on each test. They were also unfamiliar with many of the words and asked for the definition of more of the items than did the good readers/good spellers group.

When informally questioned about their strategies or approach for spelling the test items, most of the students in the poor readers/poor spellers group commented that they spelled according to "the way the word sounded." Many of them stated that they had been taught to read and spell by the phonics method in school. They did not refer to the use of any lexical or visual information as a spelling strategy.

DISCUSSION

An analysis of the types of errors and the distribution of errors of the two groups suggests that older students who are good readers/good spellers have mastered the spelling of difficult word patterns with a variant pronunciation. The good readers/good spellers group seemed to have a command of complex patterns which occur more frequently in written than spoken discourse. They have evidently internalized the higher order phonological rules which govern word pairs with a predictable change in pronunciation and/or stress and can apply these rules when appropriate. With the exception of errors involving the inappropriate substitution of a word for a test item in the vowel reduction category, as in the substitution of the word "deformation" for "defamation," the few errors the good readers/good spellers made were phonetically appropriate and preserved the sound of the derivative. To further illustrate, the most commonly occurring error made by the good readers/good spellers group was the spelling of "criticize" as "critisize," where they substituted an inappropriate grapheme and thus failed to preserve the lexical base.

The poor readers/poor spellers group, however, had not mastered the spelling of complex patterns with variant pronunciations. Their presumably limited experience and familiarity with print may have affected their ability to internalize higher order phonological rules, since much of students'

knowledge of complex patterns appears to result from their exposure to written language (Ehri, 1980; Templeton, 1979). They had a high incidence of nonphonetic errors that failed to preserve the lexical base as well as the sound of the derivative. They made what appeared to be lower level errors involving the omission of a phonemic element as in the spelling of "commercal," "residental," and "critize." They also added or substituted inappropriate graphemic elements to represent a phoneme as in "defemoration" and "opporsition."

The difference in the classification and distribution of the errors suggests that there was a difference in the variety and effectiveness of the strategies employed by the two groups. The good readers/good spellers group appeared to be using more effective strategies in spelling words where phonological information provided insufficient clues to the correct spelling. They have made the qualitative shift from the use of phonological information to the use of lexical information, a shift which some researchers maintain occurs at about age 10 as students become more experienced with print and acquire a sufficient number of visual word forms in their memory (Marsch et al., 1980).

The good readers/good spellers group appeared to be operating on a lexical rather than a phonological level. For example, in attempting to spell the word "inspiration," it is very possible that they drew on the spelling of the word "inspire," since they were aware of the relationship between word pairs on the test. They apparently recognized that even though the quality of the vowel changes with the addition of the suffix, the graphemic representation remains the same to preserve the lexical base.

The poor readers/poor spellers, in contrast, appeared to operate on the phonological or surface level and relied on phonological information which is usually ineffective when spelling polysyllabic words with silent letters and changes in the stress patterns. Most of these students had apparently not yet made the qualitative shift to the use of lexical information, since most of their errors failed to preserve the lexical base of the derivative. To illustrate, there is little evidence to suggest that the students who spelled "defame" and "compete" correctly and then spelled "defamation" as "defonation" or "deframation" and "competition" as "comportition" recognized the relationship between word pairs. Most of the poor readers/poor spellers group did not recognize the pattern principle presented in each test until it was pointed out after the completion of testing.

A few of the better spellers in the poor readers/poor spellers group seemed to be making higher level errors which suggested that they had mastered some of the more elementary phoneme-grapheme correspondence rules, but they apparently still had some difficulties with some of the conditional rules which are based on knowledge of intraword structure. For example, some of the students substituted the grapheme "s" for the "c" in "criticize" and instead wrote "critisize." Although they selected an acceptable graphemic alternative, their choice reflected a lack of knowledge of how the words "criticize" and "critical" were related.

There is some evidence from the errors made by the poor readers/poor spellers group to suggest that some of the poor spellers may have attempted to use visual information, which is an important aspect of correct spelling and the development of effective spelling strategies (Barron, 1980; Frith, 1978; Marsh et al., 1980; Schachter & Nicholson, 1979; Simon & Simon, 1973). A few of the students in the poor readers/poor spellers group appeared to use visual information when spelling words with a consonant alternation or a consonant alternation from a silent to articulated consonant. To illustrate, they produced misspellings with transposed letters such as "commerical" for "commercial" and "muscluar" for "muscular" which suggests that, although they could produce the correct word length, they could not produce the correct letter-by-letter sequence.

IMPLICATIONS

The analysis of the spelling errors made by college students who are good readers/good spellers and college students who are poor readers/poor spellers provides important information about instructional objectives for secondary and college level students. Spelling instruction should be closely integrated with vocabulary development and writing activities to help students make some useful generalizations about the underlying logic and regularity of the orthographic system. Teachers can help poor spellers make the critical transition from a sound-based to a lexically based interpretation of the writing system by helping students become more familiar with the visual or written, in contrast to the spoken, representation of word structure. Through frequent exposure to written words, students develop an awareness of the spelling/meaning connection and internalize the similarities between related forms with variant pronunciations (Templeton, 1983).

Teachers can also build on students' existing vocabularies and help them make connections between words they already know such as "historical"/"historian" and "console"/"consolation" to further emphasize the similarities in form and meaning. As students consider related word forms, they develop higher order spelling strategies and a systematic means of dealing with large segments of vocabulary (Chomsky, 1970, p. 65). They develop a more efficient system for the storage and organization of lexical entries, since they are no longer forced to store words as isolated units in their personal lexicon, or internal word bank.

Older students and adults who are poor spellers also need explicit instruction in pattern principles to develop an understanding of higher order phonological rules which govern changes in the pronunciation of a related form. They need directed activities in grouping various patterns reflecting the derivational aspects of English, so they can make some generalizations about pattern principles. They should be systematically introduced to alternation patterns involving silent/sounded consonants in related words, such as "sign"/"signature." They should also be introduced to alternation patterns involving a change in pronunciation and/or stress as in "compete"/"competition" where a long vowel is shortened to a schwa and "insane"/"insanity" where a long vowel becomes a short vowel. When students have mastered the more basic patterns, they can be introduced to more difficult alternation patterns involving both a change in the pronunciation and the spelling as in "explain"/"explanation" and "receive"/"reception." After students become familiar with pattern principles, they can begin to search for and identify patterns representative of each type in print so they can better apply the pattern principles in their own writing.

Finally, students must be given the opportunity to observe and note their own spelling errors to foster the development of better proofreading habits and self-correction strategies. Students must, however, do more than simply list and correct their errors. With the help of the instructor, they must attempt to determine the pattern and cause of their spelling errors to avoid future errors on similar words.

CONCLUSIONS

There appears to be a qualitative as well as a quantitative difference in the number and types of spelling errors made by college students who are good readers/good spellers and college students who are poor readers/poor spellers. The number and type of errors college students made seemed to be a function of the pattern type as well as their understanding of pattern principles. The few errors made by the good readers/good spellers group were generally classified as phonetic, while the overwhelming majority of the

errors made by the poor readers/poor spellers group were classified as nonphonetic.

The results of this study are limited, however, to an examination of spelling errors made in isolation. Students' spelling errors made in the context of writing were not examined. The results of this study are also limited to an examination of only four complex word patterns and two general categories of phonetic and nonphonetic errors. The scoring system did not allow for a distinction between the types of errors within the categories, since higher and lower order errors were collapsed into one of those two categories.

Additional studies are needed to examine the spelling errors and strategies of good readers/poor spellers, since all of the poor spellers in this study were also poor readers. Additional research is also necessary to access students' understanding of the underlying logic of the orthographic system and their ability to internalize complex word patterns to further understand the development of the spelling process in older students and adults.

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Vowel Alternation Patterns

1. Decide - decision
2. obscene - obscenity
3. compose - composite

Rule for Doubling Letters

10. controlled
11. beginning
12. compelled

Vowel Reduction Patterns

4. acquire - acquisition
5. refer - reference
6. compose - composition

Consonant Alternation Patterns

7. practice - practical
8. reduce - reduction
9. right - righteous

Rule for Changing "Y" to "I"

13. duties
14. earliest
15. studies

Silent Letters

16. adjustment
17. autumn
18. condemn

Figure 1. Diagnostic test.

Vowel Reduction Pattern

Reduction of a tense vowel to a schwa:

inspire - inspiration
compete - competition
oppose - opposition
defame - defamation

Vowel Alternation Pattern

Alternation of a tense vowel to a lax vowel or a lax vowel to a tense vowel:

divine - divinity
profane - profanity
nation - national
verbose - verbosity

Consonant Alternation Pattern

Consonant alternation:

resident - residential
habit - habitual
commerce - commercial
invade - invasion
criticize - critical

Consonant Alternation from Silent to Articulated

Consonant alternation from a silent to an articulated consonant:

design - designate
bomb - bombardment
condemn - condemnation
muscle - muscular
malign - malignant

Figure 2. Test items used in the study.